



Final Report  
for  
ONR N00014-93-1-0130  
August 10, 1994

Project Title: "Review and Synthesis with R. L. Smith of Recent Progress in Coastal Upwelling Research"

Principal Investigator:

Richard T. Barber  
Duke University School of the Environment  
Marine Laboratory  
Beaufort, NC 28516-9721

(919)728-2111 or rbarber@acpub.duke.edu

Coastal upwelling ecosystems are ocean regions where physics and biology combine to produce high rates of chemical, biological and geochemical transformations and fluxes. In 1968 R. L. Smith reviewed coastal upwelling literature, concentrating on physical oceanography; and in 1981 Barber and Smith reviewed and synthesized results from the decade of the 1970's with emphasis on ecosystem structure and function. Building on these two reviews, Smith and Barber, for this project, reviewed and synthesized recent progress in understanding the physical, chemical, biological and geological aspects of coastal upwelling. In July 1993, Barber spent one month at Oregon State University in Corvallis, Oregon, working with Smith. Smith's synthesis of recent advances in the physical oceanography of coastal upwelling was used as the starting point for our interdisciplinary review; the scope of the review was work which had been published from 1983 to 1993. From that period, 379 papers on coastal upwelling research were found and classified according to regions and processes outlined on the attached sheet.

Coastal upwelling research in the 1980's extended to areas much farther seaward, to better seasonal coverage and to all regions of the world ocean where coastal upwelling is an important process. In addition to greatly improved spatial coverage in results, recent work has provided improved resolution of temporal variability, geochemical transformations, the role of the coastal undercurrent, as well as processes important for transport to sediments and the ocean interior.

The final synthesis is in the form of a manuscript entitled, "Coastal Upwelling Research, 1983-1993," which is in preparation for *Progress in Oceanography*.

DISTRIBUTION STATEMENT A  
Approved for public release  
Distribution Unlimited

19950925 027

94 8 16 051

KEY FOR TOPIC SORTING

REGIONS - first column designation

- 1 Benguela Current
- 2 Canary Current
- 3 Peru Current
- 4 California Current
- 5 Leeuwin Current
- 6 Somali Current
- 7 Other regions
- 8 Comparative
- 9 General

PROCESSES - second and third column designations

- A0 Atmospheric forcing

Physics

- B0 Surface currents
- B1 Wind-driven upwelling circulation
- B2 Fronts and jets
- B3 Poleward undercurrent
- B4 Hydrography and general physical oceanography
- B5 General circulation
- B6 Modeling and theory
- B7 Heat budget
- B8

Biology

- C0 Physical/biological coupling
- C1 Ocean color and thermal fields
- C2 Primary production and phytoplankton abundance
- C3
- C4
- C5 Zooplankton
- C6 Nutrients
- C7 Recruitment and succession
- C8 Species and community structure
- C9 Ecosystem function and models

Geology

- D1 Sediments
- D2 Carbon and organic flux
- D3 Oxygen
- D4 Trace metals
- D5 Benthos

- E0 El Niño

Accesion For	
NTIS	CRA&I
DTIC	TAB
Unannounced	
Justification .....	
By <i>per ltr</i>	
Distribution /	
Availability Codes	
Dist	Avail and/or Special
A-1	